



TGS2352-2-SM

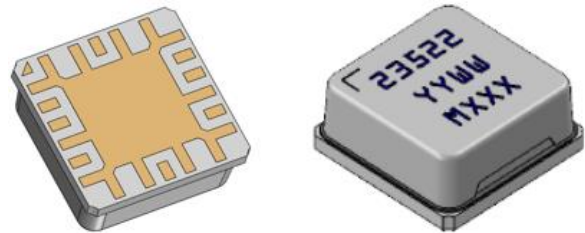
0.5 - 12 GHz High Power SPDT Reflective Switch

Product Overview

Qorvo's TGS2352-2-SM is a single-pole, double-throw (SPDT) reflective switch packaged in a 4x4mm ceramic, air-cavity QFN.

Fabricated on Qorvo's QGaN25 0.25um GaN on SiC production process, the TGS2352-2-SM operates from 0.5-12GHz and can switch up to 20W with low insertion loss and high isolation.

The TGS2352-2-SM performance allows it to be used in a variety of applications across commercial and military markets; low and high power.

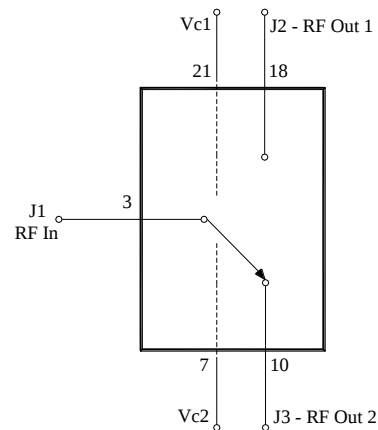


QFN 4x4 mm 22L

Key Features

- SPDT, Reflective
- Frequency Range: 0.5 to 12 GHz
- Input Power: up to 20 W
- Insertion Loss: <1 dB
- Isolation: -35 dB Typical
- Switching Speed: <35 ns
- Control Voltages: 0 V/-40 V
- Dimensions: 4.0 x 4.0 x 1.42 mm

Functional Block Diagram



Applications

- Commercial and Military Radar
- Communications
- Electronic Warfare
- Test Instrumentation
- General Purpose

Ordering Information

Part No.	Description
TGS2352-2-SM	0.5-12 GHz High Power SPDT Reflective Switch
1112636	Waffle Pack, Samples, Qty 2
1075674	Waffle Pack, Qty 50
TGS2352-2-SMEVB	TGS2352-2-SM Evaluation Board

Absolute Maximum Ratings

Parameter	Rating
Control Voltage (V_C)	-50 V
Control Current (I_C)	-1.5 / 6 mA
Power Dissipation	5 W
RF Input Power, CW, 50 Ω , T = 25 °C	44 dBm
Channel Temperature, T_{CH}	275 °C
Mounting Temperature (30 sec)	320 °C
Storage Temperature	-40 to 150 °C

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
V_{C1}		-40/0		V
V_{C2}		0/-40		V
I_{C1} / I_{C2}		-0.25 to 0.1		mA

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

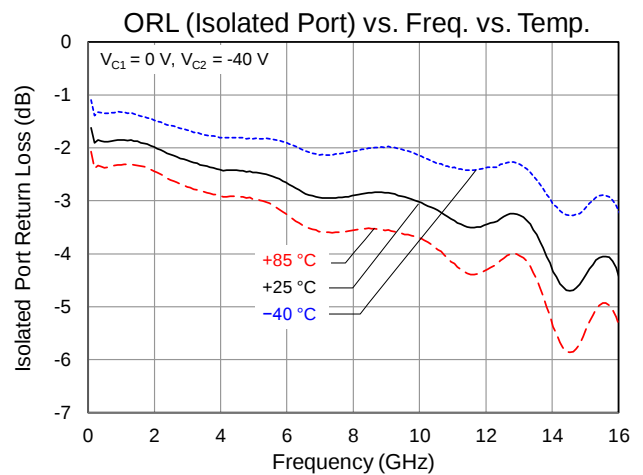
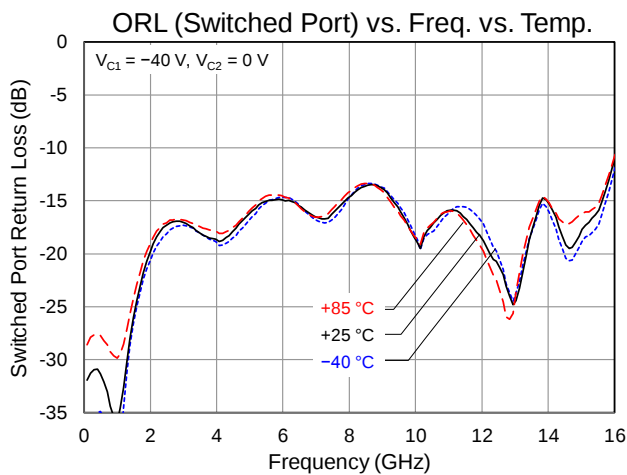
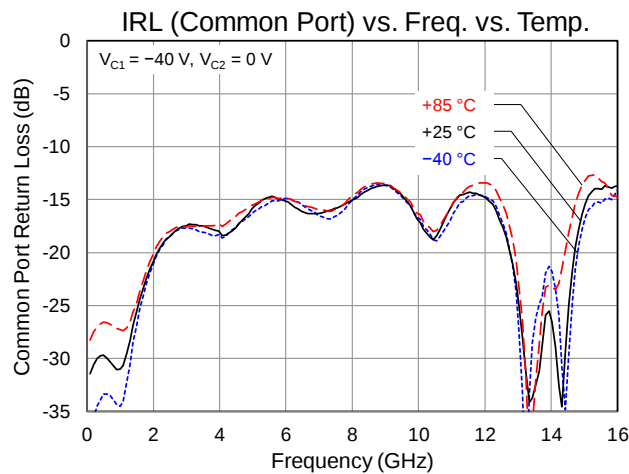
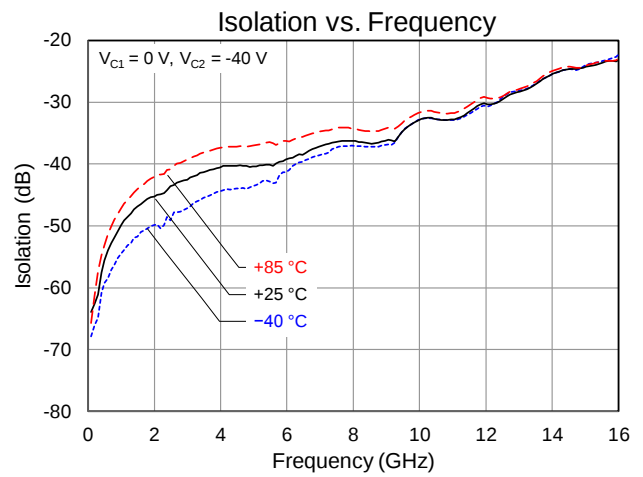
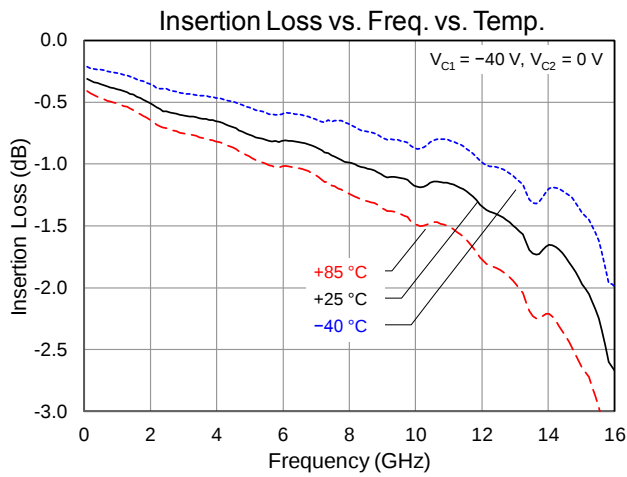
Electrical Specifications

Parameter	Conditions ⁽¹⁾	Min	Typ	Max	Units
Operational Frequency Range		0.5		12	GHz
Insertion Loss			<1		dB
Input Return Loss – Common Port			15		dB
Output Return Loss – Switch Port			15		dB
Isolation			35		dB
Output Return Loss – Isolated Port			3		dB
Input Power			43		dBm
Insertion Loss Temperature Coefficient			-0.004		dB/°C
Switching Speed – On			31		ns
Switching Speed – Off			18		ns

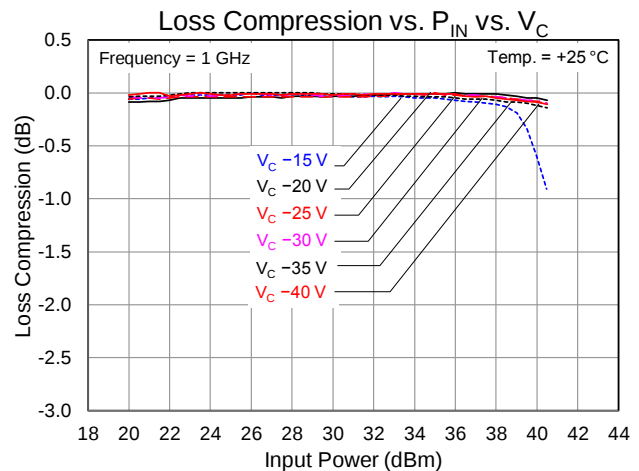
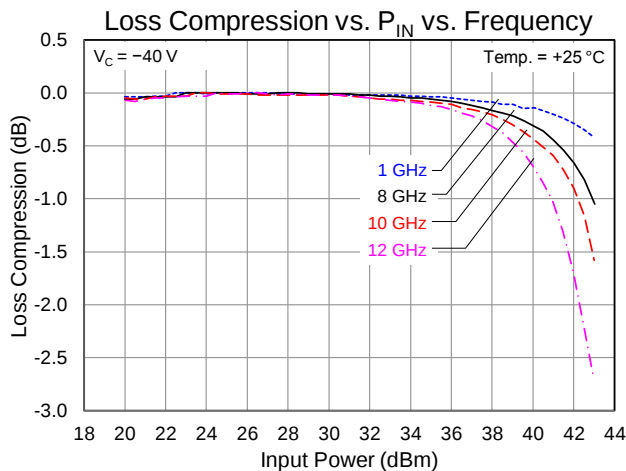
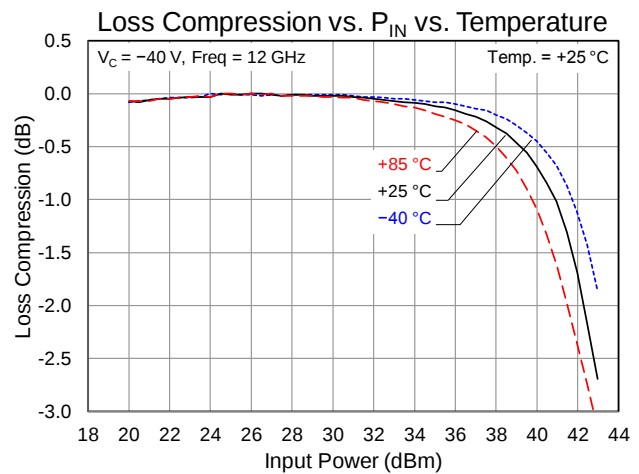
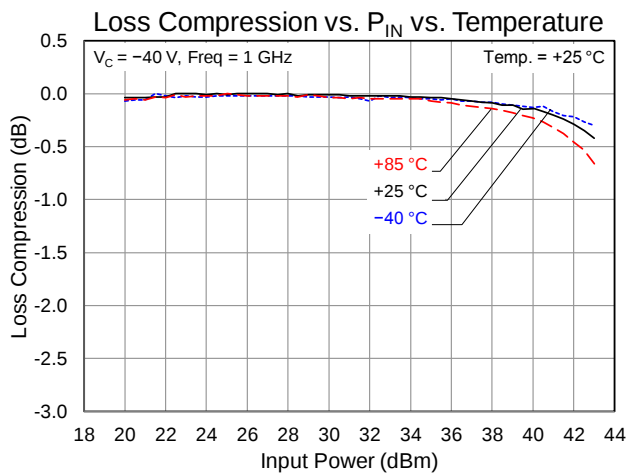
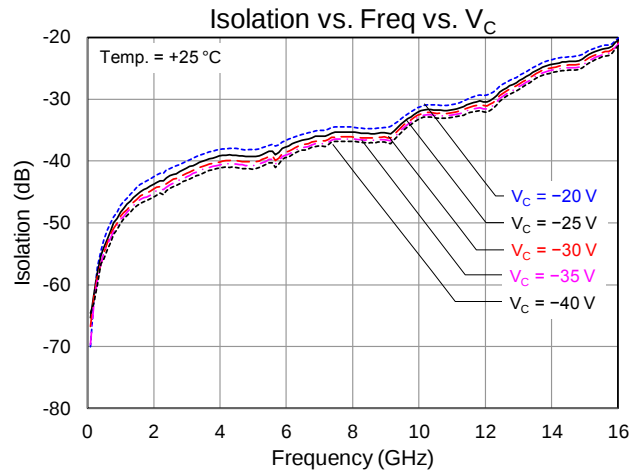
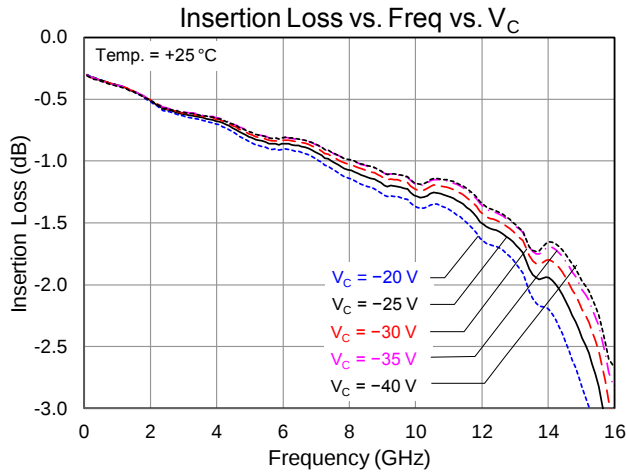
Notes:

1. Test conditions unless otherwise noted: Temp= +25°C. V_{C1} = -40/0 V, V_{C2} = 0/-40 V, see Function Table on page 7

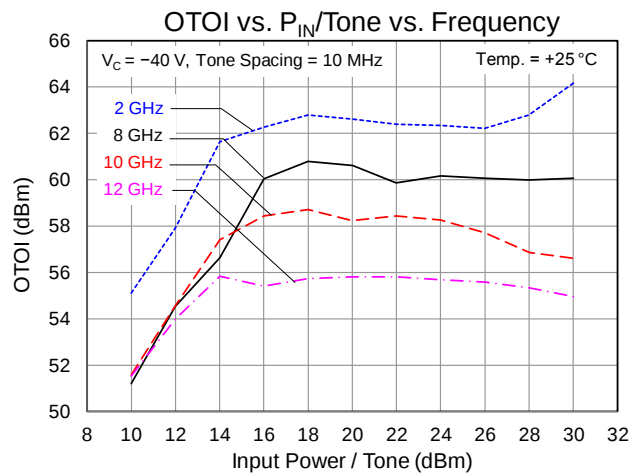
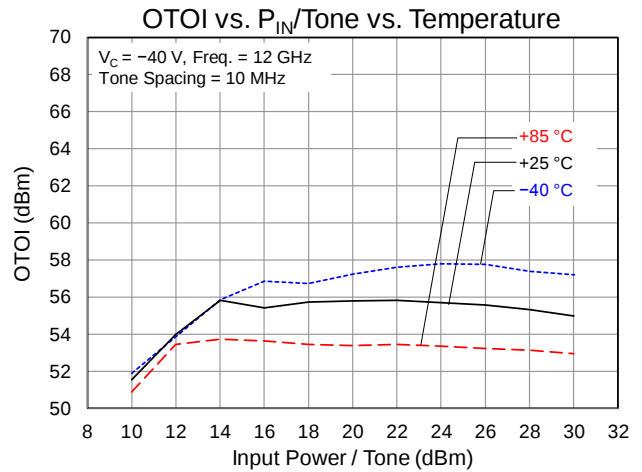
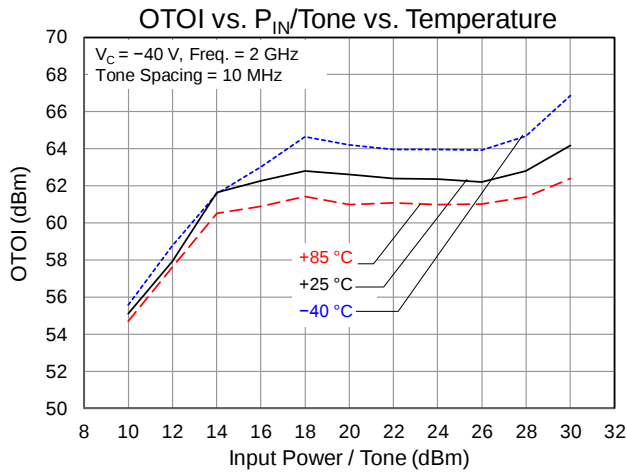
Performance Plots – Small Signal



Performance Plots – Small Signal and Compression



Performance Plots – Linearity



Thermal and Reliability Information

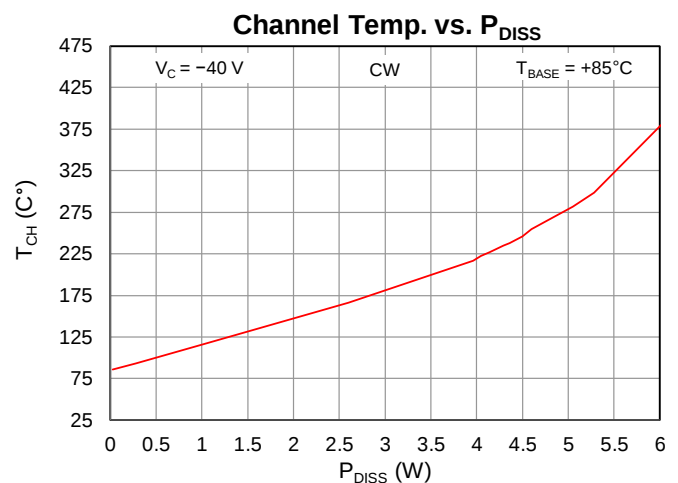
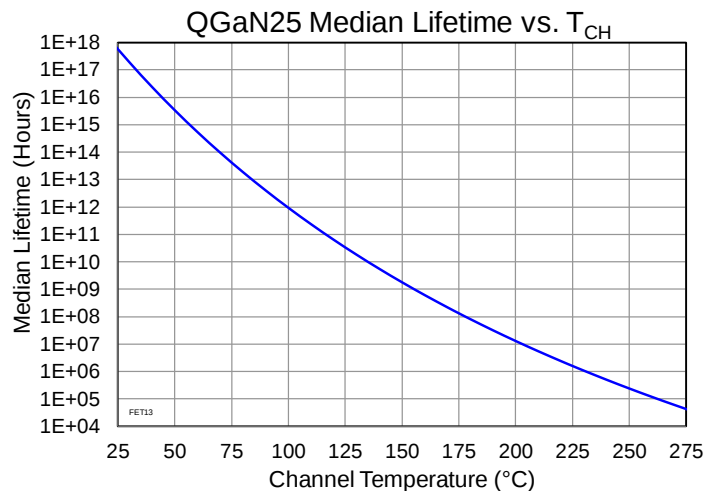
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^\circ\text{C}$, $V_{C1} = 0\text{ V}$, $V_{C2} = -40\text{ V}$, Freq. = 4 GHz, CW $P_{IN} = 43\text{ dBm}$, $P_{OUT} = 41.95\text{ dBm}$, $P_{DISS} = 4.29\text{ W}$	34.96	$^\circ\text{C/W}$
Channel Temperature (T_{CH}) ⁽¹⁾		235	$^\circ\text{C}$
Median Lifetime (T_M)		7.16E+5	Hrs
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^\circ\text{C}$, $V_{C1} = 0\text{ V}$, $V_{C2} = -40\text{ V}$, Freq. = 5 GHz, CW $P_{IN} = 42.5\text{ dBm}$, $P_{OUT} = 41.2\text{ dBm}$, $P_{DISS} = 4.6\text{ W}$	36.96	$^\circ\text{C/W}$
Channel Temperature (T_{CH}) ⁽¹⁾		255	$^\circ\text{C}$
Median Lifetime (T_M)		1.65E+5	Hrs
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^\circ\text{C}$, $V_{C1} = 0\text{ V}$, $V_{C2} = -40\text{ V}$, Freq. = 8 GHz, CW $P_{IN} = 41\text{ dBm}$, $P_{OUT} = 39.15\text{ dBm}$, $P_{DISS} = 4.36\text{ W}$	35.09	$^\circ\text{C/W}$
Channel Temperature (T_{CH}) ⁽¹⁾		238	$^\circ\text{C}$
Median Lifetime (T_M)		5.70E+5	Hrs
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^\circ\text{C}$, $V_{C1} = 0\text{ V}$, $V_{C2} = -40\text{ V}$, Freq. = 10 GHz, CW $P_{IN} = 40.5\text{ dBm}$, $P_{OUT} = 38.5\text{ dBm}$, $P_{DISS} = 4.14\text{ W}$	34.30	$^\circ\text{C/W}$
Channel Temperature (T_{CH}) ⁽¹⁾		227	$^\circ\text{C}$
Median Lifetime (T_M)		1.33E+6	Hrs
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85^\circ\text{C}$, $V_{C1} = 0\text{ V}$, $V_{C2} = -40\text{ V}$, Freq. = 12 GHz, CW $P_{IN} = 40\text{ dBm}$, $P_{OUT} = 37.4\text{ dBm}$, $P_{DISS} = 4.5\text{ W}$	35.78	$^\circ\text{C/W}$
Channel Temperature (T_{CH}) ⁽¹⁾		246	$^\circ\text{C}$
Median Lifetime (T_M)		3.15E+5	Hrs

Notes:

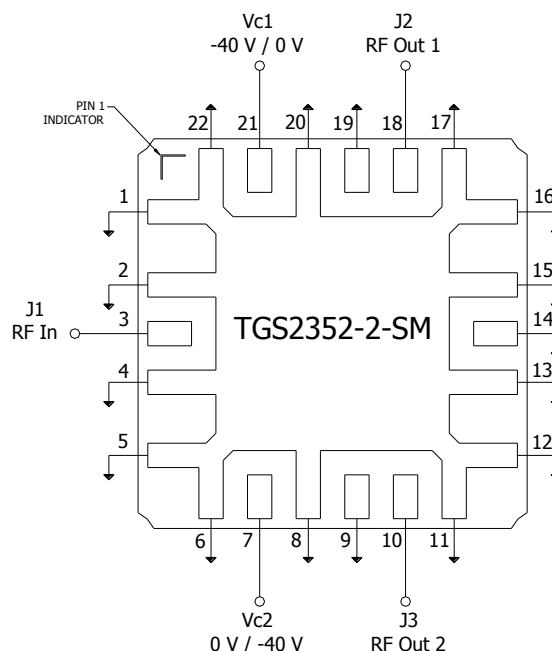
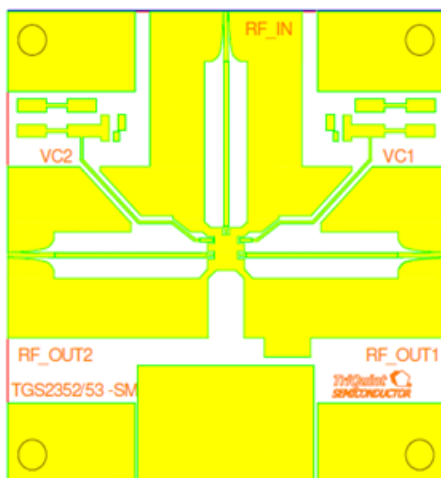
1. Measured to the back of the package.

Median Lifetime and Channel Temperature

Test Conditions: $V_D = +40\text{ V}$; Failure Criteria = 10% reduction in I_{D_MAX} during DC Life Testing



Evaluation Board (EVB) and Application Circuit



Notes:

1. This switch can be configured as a Single Pole, Single Throw (SPST) by terminating one unused RF switched port with a 50 Ohm load.

Bias Up Procedure

1. V_{C1} or V_{C2} set to 0 V (see Function Table for RF Path)
2. V_{C2} or V_{C1} set to -40 V (see Function Table for RF Path)
3. Apply RF signal to RF Input

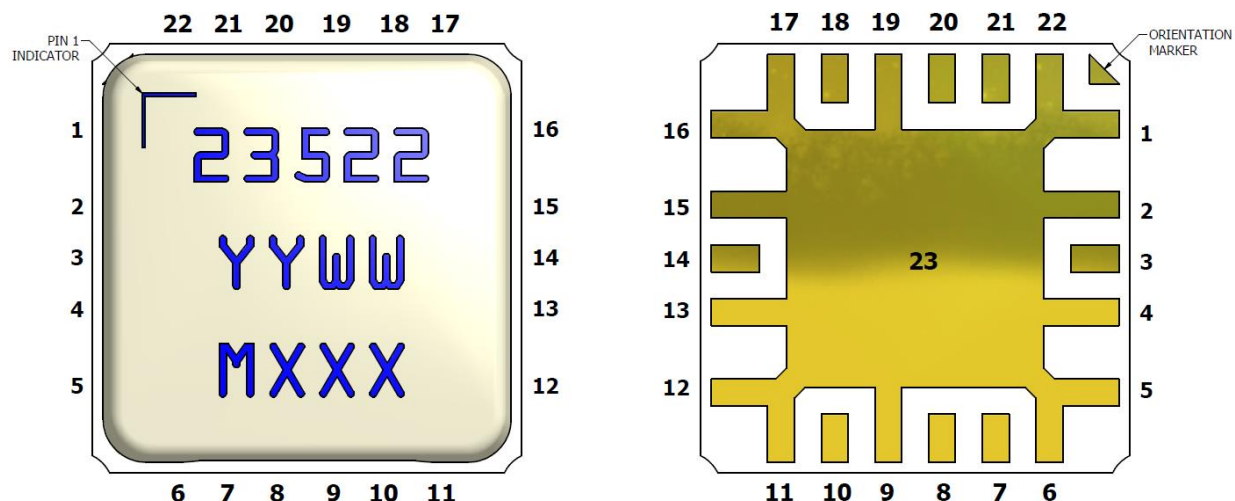
Bias Up Down

1. Turn off RF supply
2. Turn V_{C2} or V_{C1} to 0 V
3. Turn V_{C1} or V_{C2} to 0 V

Function Table

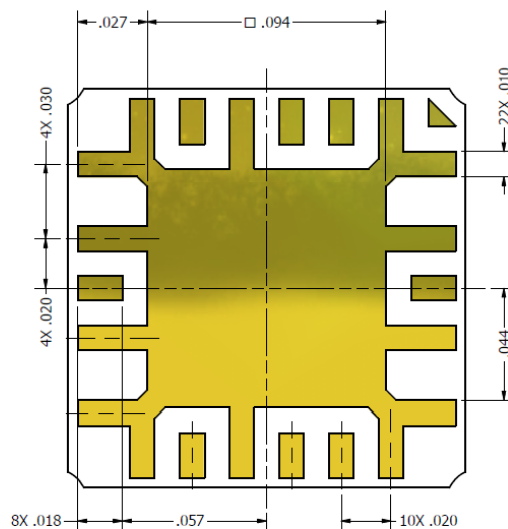
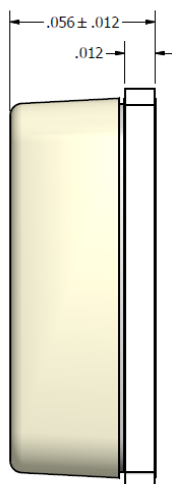
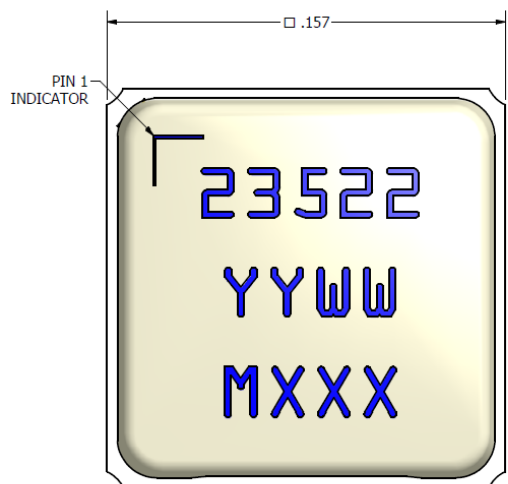
RF Path	State	V_{C1}	V_{C2}
RF In to RF Out1 (50 Ω load to RF Out2)	On-State (Insertion Loss)	0 V	-40 V
	Off-State (Isolation)	-40 V	0 V
RF In to RF Out2 (50 Ω load to RF Out1)	On-State (Insertion Loss)	-40 V	0 V
	Off-State (Isolation)	0 V	-40 V

Pin Configuration and Description



Pin No.	Label	Description
1, 2, 4-6, 8, 9, 11-17, 19, 20, 22	GND	Connected to ground paddle (23); must be grounded to PCB to improve isolation.
3	RF IN	RF Input, matched to 50 Ω ; DC coupled
7	V _{C2}	Control voltage #2; External components are not required
10	RF OUT2	RF switched port 2; matched to 50 Ω ; DC coupled
18	RF OUT1	RF switched port 1; matched to 50 Ω ; DC coupled
21	V _{C1}	Control voltage #1; External components are not required
23	GND	Backside paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

Package Marking and Dimensions



NOTES:

- MATERIAL:**
PACKAGE BASE: CERAMIC
PACKAGE LID: PLASTIC
- PACKAGE LAND PATTERN IS GOLD PLATED.
- PART IS EPOXY SEALED.
- PART MARKING:**
23522 : PART NUMBER
YY : PART ASSEMBLY YEAR
WW : PART ASSEMBLY WEEK
MXXX : BATCH ID

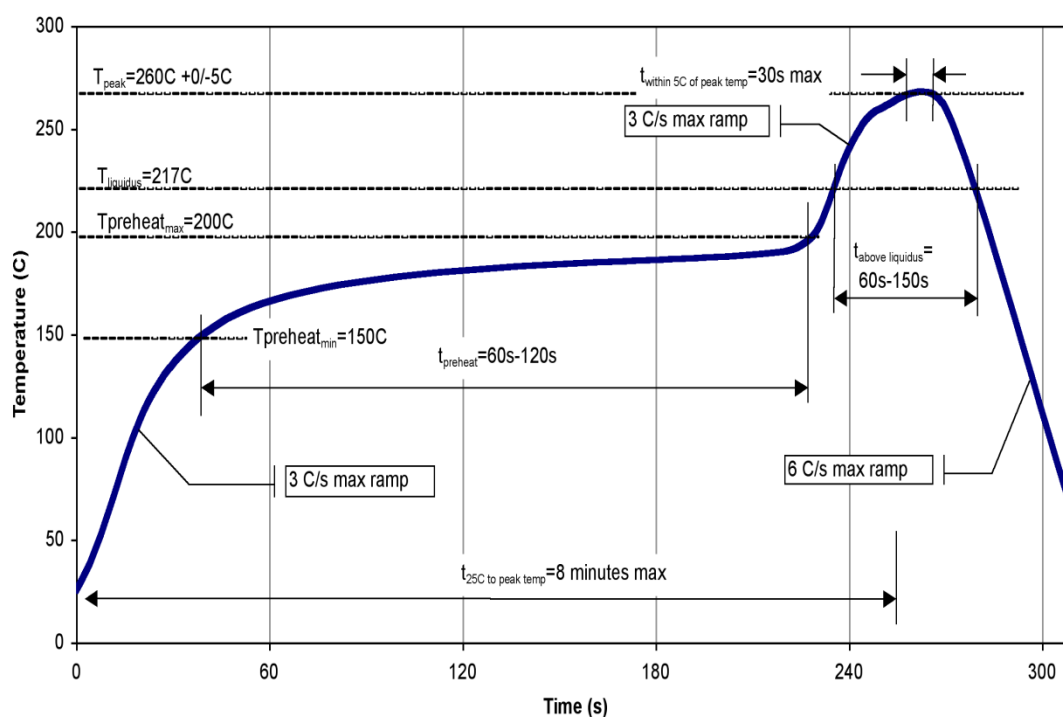
Notes:

UNLESS OTHERWISE
SPECIFIED DIMENSIONS
ARE IN INCHES
TOLERANCES
X.XX = $\pm .01$
X.XXX = $\pm .005$
X.XXXX = $\pm .0010$
ANGLES = $\pm 1^\circ$

Solderability

1. Compatible with the latest version of J-STD-020, Lead-free solder, 260° C.
2. The use of no-cledean solder to avoid washing after soldering is recommended.

Recommended Soldering Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JESD22-A114
MSL – Moisture Sensitivity Level	Level 1	IPC/JEDEC J-STD-020



Caution!
ESD-Sensitive Device

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

For technical questions and application information: **Email:** appsupport@qorvo.com

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